



A Quick Review

I. Summing up to Date.....

- Past Independent Technical Reviews
- Community Input
- Ongoing Technical Efforts

II. Clarifications

- Tritium Sampling and Analysis Plan
- Ongoing Environmental Management Program

III. A Modest Proposal

- Moving forward in three media under the Tritium Sampling and Analysis Plan

IV. Berkeley Lab Response to Comments



Past Technical Reviews

- NIH Safety Review
- Scientific Advisory Committee
- Technical and Safety Advisory Committee (TSAC)
- Tritium Risk Assessment (Tom McCone)
- Review of Tritium Risk Assessment (Tore Straum)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- SENES Risk Assessment for LHS Visitors (Owen Hoffman)
- IFEU Report (Bernd Franke)
- SENES Cancer Risk Assessment for LHS Employees (Owen Hoffman)
- Regulatory Agencies (EPA, RWQCB, DOE, and COB)



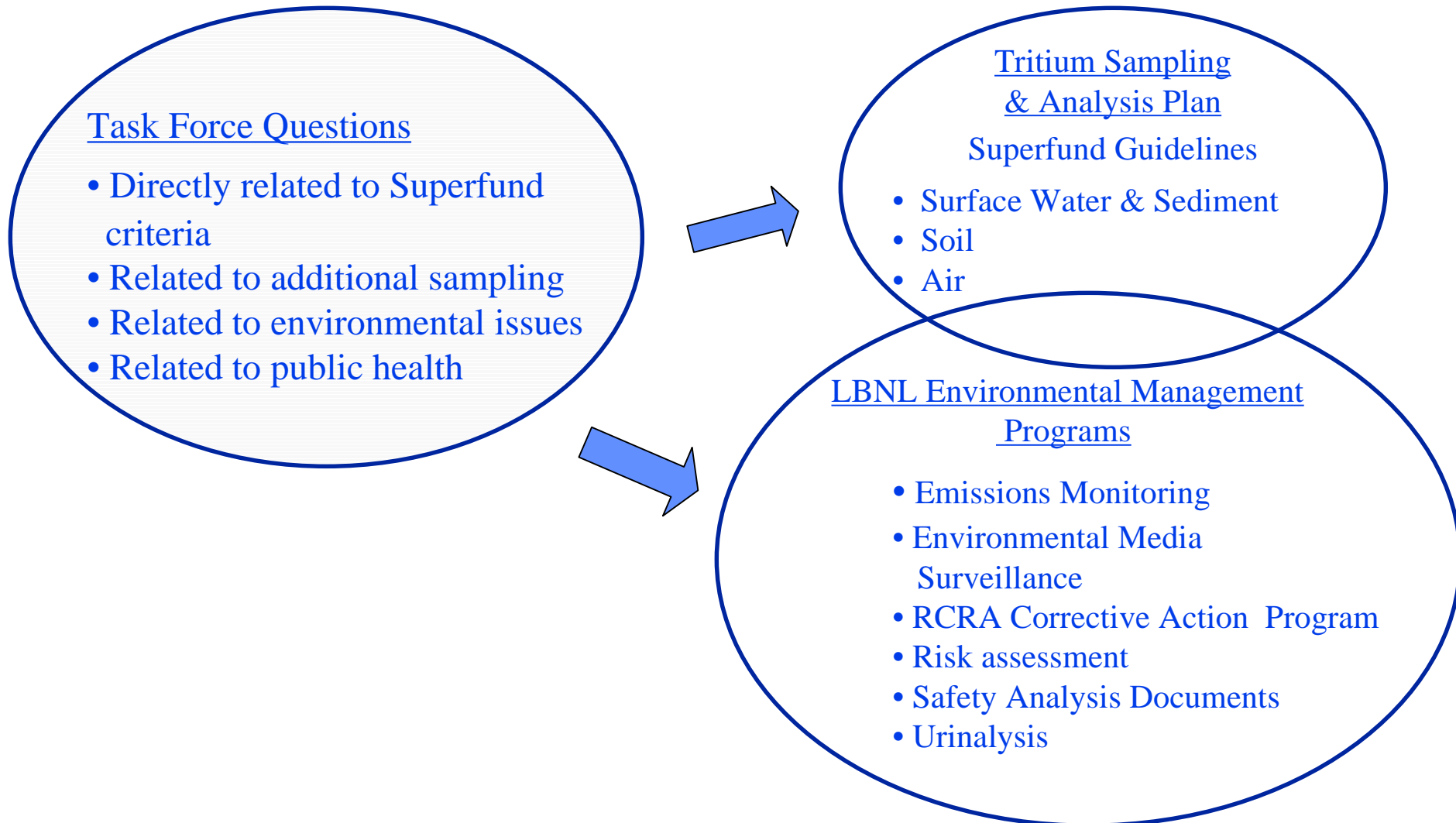
Community Input

- Tritium Issues Work Group
- Environmental Sampling Project Task Force

Ongoing Technical Efforts

- Environmental Monitoring Program
- UC Davis Scaled Wind Tunnel Model (Bruce White)
- Additional CALPUFF Dispersion Modeling

Clarifications





Moving Forward in Three Media Under a Modified Tritium Sampling and Analysis Plan

Medium	Hazard Ranking System (Superfund)	Task Force	Proposed For Sampling To Begin
Surface Water and Sediment	✓	✓	✓
Vegetation		✓	✓
Soil	✓	✓	✓
Air	✓	✓	
Groundwater		✓	
On-Site Radiation Worker Urinalysis		✓	
General		✓	



Structure of Presentation

- Three media to be discussed tonight:
 - Surface Water & Sediment
 - Vegetation
 - Soil
- In each medium, three sections:
 - What was proposed in the Tritium Sampling and Analysis Plan.
 - What Berkeley Lab does in ongoing monitoring programs.
 - Task force and community comments, and the Lab's responses.



Comment Area: Surface Water and Sediment

Tritium Sampling & Analysis Plan (TSAP)

- One-time sediment sampling of tritium in all seven site creeks, two locations for each creek.
- One-time surface water sampling from all seven site creeks, two locations for each creek.



Comment Area: Surface Water and Sediment

Ongoing Laboratory Program(s)

- Annual sediment sampling from main and tributary creek beds of the North Fork of Strawberry Creek and Chicken Creek. Sediment is analyzed for gross alpha and gross beta radiation, gamma emitters, tritium, metals, polychlorinated biphenyls (PCBs), petroleum hydrocarbons, and pH.



Comment Area: Surface Water and Sediment

Ongoing Laboratory Program(s) (continued)

- Extensive surface water monitoring including:
 - Monitoring of rainwater in months where there is rain, at three stations, analyzed for alpha and beta radiation and tritium.
 - Quarterly monitoring of five creeks for alpha and beta radiation and tritium, plus these and five ephemeral creeks which are sampled once/year for tritium, metals and VOCs.
 - Annual sampling of two lakes in the area for alpha and beta radiation and tritium.
 - Storm water monitoring of five locations at creeks, for substances prescribed by the permit, plus other substances including metals, tritium, alpha and beta emitters, and total petroleum hydrocarbons.



Comment Area: Surface Water and Sediment

Task Force and Community Comments

1. DOE should discuss background samples. The HRS Guidance Manual indicates that samples from an analogous water body outside the area influenced by the site may provide background levels. (U.S. EPA Letter to Lab, 8-25-99, Comment 2A).

- **Berkeley Lab had promised to address this issue in its answer to EPA.**
- **The Lab will add sampling from two lakes as an indication of background.**



Comment Area: Surface Water and Sediment

Task Force and Community Comments, (continued)

2. Sample locations for surface water and sediment should include the storm drain outfall to San Francisco Bay and “daylighted” portions of the Strawberry Creek. A tiered approach to surface water and sediment sampling, such as DOE has proposed for soil sampling, would be acceptable. (U.S. EPA letter to Lab, 8-20-00, Comment 2B).
 - **The EPA’s suggestion for “tiered” sampling is appropriate.**
 - **If tritium is detected in any of the surface water samples, the Lab will mathematically estimate the concentration of tritium in the creek at the outfall contributed by Berkeley Lab.**
 - **If the estimate is above the cancer-risk screening concentration (660 pCi/L), we will calculate the tritium activity in Strawberry Creek sediments.**



Comment Area: Surface Water and Sediment

Task Force and Community Comments (continued)

3. The proposed program of sediment and surface water and vegetation sampling is well designed. No changes appear necessary (Franke/IFEU Preliminary Technical Report, page 18, B.1).



Comment Area: Vegetation

Tritium Sampling & Analysis Plan (TSAP)

- Representative tree wood, leaf, and duff samples will be collected from selected trees at 8 locations and from a remote background location.
- Wood, leaf, and duff samples will be analyzed in a DHS-certified laboratory for tissue-free water tritium (TFWT) and organically bound tritium (OBT).
- Sampling will occur once in November and once in May, in order to sample during both wet and dry periods.
- Transpired water samples will be collected at 3 locations and a remote location, and will be analyzed for tritiated water.



Comment Area: Vegetation

Ongoing Laboratory Program(s)

- Representative areas at the Laboratory have been sampled in past years for TFWT and OBT in eucalyptus and pine wood chips, leaves, and duff. Background levels have been established from samples collected at Chabot Regional Park.
- Details of vegetation sampling are evaluated each year, based on projected tree removal activities.



Comment Area: Vegetation

Task Force and Community Comments

1. Do vegetation sampling. Include the Menchaca study for review as a model of a sampling plan for vegetation. (6/1, p. 67, 3; 6/1, p. 68, 20; 6/1, p. 89, 4 ff. and 21; 6/1, p. 111, 16 ff., 8/10, p. 71, 19).
 - **Vegetation and transpired water samples are not required for the EPA Hazard Ranking System, but Berkeley Lab had already included both sample types in the TSAP in response to community concerns.**
 - **Dr. Menchaca's vegetation tritium data was reported in both the 1995 and 1996 Site Environmental Reports. It was also presented to the public in March of 1997 within the framework of the Tritium Issues Work Group meetings. Her data was used for planning and conducting subsequent vegetation monitoring in 1997, 1998, and 1999.**
 - **Tree wood, leaf, and duff samples will be collected and analyzed for both tissue-free water tritium (TFWT) and organically bound tritium (OBT).**
 - **Transpired water samples will also be collected and analyzed for tritiated water (HTO).**



Comment Area: Vegetation

Task Force and Community Comments (continued)

2. Include the OBT that was measured at the Lab in '94 and '96 in the EPA review. Is there a clear protocol for gathering OBT data? How does one distinguish OBT from tritium bound water? How are samples prepared and analyzed? Discussion of OBT could help here (6/1, p. 87, 21), although most of tritium is in water, not OBT. (6/1, p. 72, 15; 6/1, p. 78, 7; 6/1, p. 87, 21; 6/1, p.95, 16; 4/25, p. 80, 7; 4/25, p. 86, 25 ff.).

- There is no EPA-approved protocol for collecting vegetation for OBT analysis; however, Berkeley Lab has a standardized vegetation sampling procedure.
- There is no EPA-approved protocol for the analysis of vegetation for tritium (TFWT or OBT); however, the certified analytical lab that Berkeley Lab uses will apply standardized analytical procedures for TFWT and OBT analysis.



Comment Area: Vegetation

Task Force and Community Comments (continued)

- TFWT and OBT are two separable tritium compartments within vegetation.
 - To measure TFWT, tissue free water (containing TFWT) is separated from the plant matter and the extracted water is measured for tritium using a standard liquid scintillation technique.
 - To measure OBT in plant matter, plant material is first dried to a constant weight to remove the TFWT. Then the residual dry material is homogenized and a sub-sample is combusted to water and carbon dioxide. The water of combustion is collected and measured for tritium using a standard liquid scintillation technique.
- EPA did not recommend sampling in vegetation, and it is not used by the HRS.



Comment Area: Vegetation

Task Force and Community Comments (continued)

3. Do tree ring analysis and dose reconstruction. (6/1/, p. 90, 8 ff; 6/1, p. 95, 7).

- Within about 50 meters of the hillside stack, only eucalyptus trees are available to be sampled.
- Eucalyptus trees do not form well-defined growth rings that can be consistently correlated to defined time periods.
- Therefore, tree ring analysis is not a practical approach for reconstructing a tritium chronology to support dose reconstruction.



Comment Area: Vegetation

Task Force and Community Comments (continued)

4. The proposed program for sediment and surface water and vegetation sampling is well designed. No changes appear necessary. (Franke/IFEU Preliminary Technical Report, page 18, B.1).



Comment Area: Soil

Tritium Sampling & Analysis Plan (TSAP)

- Shallow soil samples will be collected at 56 locations to a maximum distance of approximately 2000 feet from the tritium stack. Sampling locations are primarily in a radial pattern, with three concentric rings at distances of 500, 1000, and 2000 feet from the stack. Additional sampling will be done in the predominant wind direction at various distances, and near the base of the stack.
- Samples will be collected from approximately 0.5 to 1.0 foot below ground surface. Locations may be modified in the field based on site constraints.



Comment Area: Soil

Tritium Sampling & Analysis Plan (TSAP) (continued)

- Based on the results of the initial sampling, additional samples may be collected. The requirement to collect additional samples will be based on two criteria:
 - If results in any sample are above 1100 pCi/g, or 1/10 of the EPA Region IX Preliminary Remediation Goal (PRG) for tritium in residential soil, we will do four additional samples within 100 feet of the sample that exceeded 1/10 of the PRG until the extent of soil contamination above 1100 pCi/g has been characterized.
 - If tritium concentrations are detected above the Minimum Detectable Activity (MDA) (0.2 pCi/g) in the sample farthest from the stack in any given 30-degree sector, we will continue to sample until the area of contamination above MDA is fully determined.



Comment Area: Soil

Ongoing Laboratory Programs and Activities Related to RCRA Corrective Action Program

- As a part of routine environmental monitoring, a limited number of soil samples are collected annually, with details of the sampling program evaluated each year in order to formulate an appropriate program. In 1999, soil samples from the top 2 to 5 centimeters (1 to 2 inches) of surface soils were collected from three locations around the site and one off-site environmental monitoring station, coincident with ambient air sampling stations.
- Under the RCRA Corrective Action Program, in 1999 25 soil samples were collected to characterize the magnitude and extent of tritium contamination in the soil. Samples are also taken for purposes such as installation of monitoring wells and lysimeters, and closure of the Hazardous Waste Handling Facility.



Comment Area: Soil

Task Force and Community Comments

1. Modify the present sampling plan to incorporate some facets that would help describe past legacy. Sample a number of locations and look at the soil profile from various layers in detail. (8/10, p. 67, 8; 8/10 p. 67, 21 and p. 69, 25).
 - **Berkeley Lab's ongoing RCRA Corrective Action Program has already engaged in such an effort.**
 - **EPA's HRS guidance manual dictates that soil samples be collected in the top 2 feet of soil.**
 - **In order to satisfy community concerns and the EPA request:**
 - **Berkeley Lab will take soil samples at 2 depths for each location, one from 6-12 inches and one from 18-24 inches down.**
 - **Berkeley Lab will collect 8 additional soil samples from the area around the stack.**



Comment Area: Soil

Task Force and Community Comments (continued)

2. The HASL-300 core method should be used for soil sampling (Franke/IFEU Preliminary Technical Report).
 - **The soil core sampling and processing procedure discussed in HASL-300 is not designed for the measurement of HTO in soil.**
 - **The HRS requires soil tritium data from the top 1-2 feet. The HASL-300 procedure is designed for measurement of particulate deposition, not tritiated water vapor.**
 - **The soil sampling in the TSAP was based on the large set of historical soil tritium measurements collected by Berkeley Lab's RCRA Corrective Action Program.**
 - **Berkeley Lab will apply an expanded sampling methodology for any sampling location that equals or exceeds 10% of the Preliminary Remediation Goal for residential soil (11,000 pCi/g).**



Comment Area: Soil

Task Force and Community Comments (continued)

3. It is recommended that further discussion be provided for soil sampling depth within the top two feet of soil. In particular, EPA believes that the soil nearer to the surface may be dry during the summer season and hence have low tritium levels. Samples should be taken in the sub-interval with the highest moisture content. (U.S. EPA letter to Lab, 8-20-99, Sample Collection 3).
- **Berkeley Lab is responding to this concern by sampling at two depths at each location, one from 6-12 inches and one from 18 to 24 inches below the ground surface.**